GENERAL INFORMATION

OCTOBER 1961

Soil Conservation

SOIL CONSERVATION SERVICE • U. S. DEPARTMENT OF AGRICULTURE

Growth Through Agricultural Progress

"When tillage begins, other arts follow. The farmers therefore are the founders of human civilization."

—DANIEL WEBSTER

VOL. XXVII, No. 3 OCTOBER 1961

CONTENTS

COVER PICTURE—Sam Heath of the Baker Valley Soil Conservation District in Oregon using a small land plane to prepare a field for improved irrigation.

Soil Conservation

ORVILLE L. FREEMAN
Secretary of Agriculture

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

SOIL CONSERVATION is the official organ of the Soil Conservation Service, published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication was approved by the Bureau of the Budget, June 26, 1958.

FRANK B. HARPER, Editor

15 CENTS PER COPY **$1.50 PER YEAR**

FOREIGN—$2.25 PER YEAR

25 percent discount on orders of 100 or more mailed to one address.

All orders for paid subscriptions go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Technology and Machines Speed Conservation

By Donald A. Williams

ELSEWHERE in this issue is an article entitled "Plows To Fit the Land—Land To Fit the Plows." Although oversimplified, as headlines necessarily are, it does sum up a most important aspect of the revolution that has taken place in American agriculture during the last quarter of a century.

That has been the development and spread of soil and water conservation farming, which has experienced a revolution itself since its inception in the 1930's. Conservation technology is one of modern agriculture's scientific tools that we are fortunate in having perfected to help insure that our relatively fixed land area will continue to be able to support greater numbers of people despite growing competition for its use. Conservation technology has been so effective because it has kept pace with today's realities and tomorrow's needs—not those of yesterday.

Conservation today is not the same as it was even 25 years ago. Modern science and technology have changed the goals and methods of conservation greatly. Thus better understanding of soil and plant relationships enables conservation farmers to modify tillage and crop-management practices for greater efficiency and improved soil protection. Modern power and machinery make available an increasing variety of measures for erosion control, water conservation, preventing flooding, and reducing sedimentation. Today's conservation technology and machines make formerly impossible jobs possible!

When we started out in this new way of farming, horse-drawn equipment still most commonly used limited the earthmoving and other operations that now have such an important place in farm operations. With such limited power, it was not practicable, and in most cases not possible, to reshape field surfaces, convert big gullies to grassed waterways, build ponds and reservoirs large enough to hold amounts of water needed for livestock, irrigation, flood prevention, or fish and wildlife, or to do many other major soil and water management jobs.

Today's power for farm machinery is supplied generally by tractors, of sizes and types to fit every need. The number of tractors on United States farms increased about six times between 1930 and 1960, or from 2½ to 14 tractors for each 1,000 acres of harvested crops; while horses and mules decreased by more than six times, from 19.1 million to 3.1 million.

Tractor power brought the development of farm implements and earthmoving machines likewise designed to fit every need, including the performance of special conservation jobs. This ever-growing family of machines includes bulldozers and wheel scrapers; landplanes or levelers; terracers and subsoilers. It includes tillage and planting implements for more efficient and faster operations; forage harvesting machinery capable of handling expanded acreages of conservation crops; and machines for harvesting and processing grass and legume seed that formerly were gathered in limited amounts by hand, or not at all. In short, it includes machines for doing every kind of conservation job, from large-scale planting of trees to lining irrigation ditches with concrete.

Conservation technology obviously could not remain geared to the horse age. Mechanization, specialized farming, changes in land use, expanded use of chemicals, and other scientific aids to agriculture dictated new and improved approaches adapted to changing facilities and needs. Conservation soil management and cropping methods were improved upon, and structural designs were altered to take advantage of new opportunities for more effective soil and water conservation accomplishment.

Earthmoving rapidly became vastly more important in conservation planning and application. Especially significant was the opening of the way for conservation to move more effectively and faster beyond individual farm and ranch boundaries into the country's 8,300 small watersheds needing project-type treatment. Flood-prevention and other structures planned or completed in authorized projects to July 1 this year involved 206 million cubic yards of earth. Private contractors and farmers themselves have moved uncalculated additional millions of cubic yards on individual farms and ranches.

The current and emerging trends in agriculture point to the very probable need for more specialized services in soil and water management from both private and public sources in the future. These will include a yet higher level of technical competence and the broadest participation by every public and governmental interest concerned.

Land Leveling "Down East" in Maine

By LeRoy M. Bingham

LAND leveling has moved across the country out of the West "down East" into Maine.

This conservation land improvement practice is used in the West primarily to get the most efficient use of oftentimes limited water supplies for irrigation. Here, the main job for land grading is to get excess water off of pasture and hay land or to keep it from doing damage if it stays on the fields.

In the Androscoggin Valley Soil Conservation District in southwestern Maine, for example, where the land is gently rolling for the most part and farming is primarily dairying, it is imperative to have well-drained land to produce good pastures and hay. In many fields with drainage ditches, the surface is ridged and pocketed; and water stands in large areas until it evaporates, resulting in serious losses through delays in seedbed preparation and from drowning of moisture-sensitive plants. Land smoothing or land grading is a means of dealing with such problems of surface-drainage improvement. It smooths the field to eliminate the uneven surfaces, permits even distribution of water, and facilitates the construction of channels to handle excess flow.

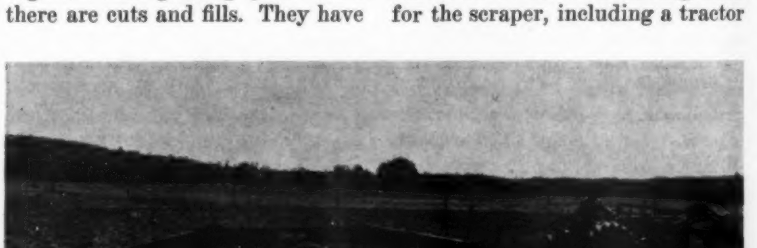
Up to 3 years ago, there was always a waiting list of district cooperators wanting technical help in getting their fields and pastures put into shape to produce early grass and hay and dry enough to work with farm machinery. The need for some type of equipment to speed this work prompted investigation that resulted in the district's buying the first land leveler in Maine, late in 1957.

The machine proved to be so satisfactory on several jobs that year and in the full 1958 season's use that the district bought a second leveler, along with a 2½-yard wheeled scraper, in 1959. At first, the leveler was used as a do-it-all, but experience showed the need for scrapers to do preliminary smoothing work and leave the levelers for the precision jobs. The district bought a second scraper in 1960, and a third in 1961.

Scrapers have many other uses beside moving dirt on land-smoothing and land-grading jobs where there are cuts and fills. They have been used to repair farm roads, fill barnyards, fill gullies, cut and place sod in waterways, spread topsoil in newly built outlets before seeding, and to build all types of ditches and waterways.

By combining cooperators' tractors and time with the district-owned equipment, the cash cost of earthmoving practices has been reduced materially in the Androscoggin Valley district.

The cost of bulldozer jobs in 1957 was 47¢ a cubic yard for 10 local earthmoving jobs. The cost to district cooperators in 1959 for 7 earthmoving jobs with the scrapers was 16¢ a cubic yard, plus the costs of owning and operating the tractor and the operator's wages. The total of all earthmoving costs for the scraper, including a tractor



Earland Morrison using district land leveler before seeding field near Auburn, Maine.

Note:—The author is work unit conservationist, Soil Conservation Service, Auburn, Maine.

ne

ads, fill
d place
topsoil
re seed-
ditches

s' trac-
district-
cost of
been re-
droscog-

jobs in
for 10
he cost
959 for
e scrap-
plus the
ing the
wages.
g costs
tractor

Auburn,

Newly completed land leveling on Harold Souther farm.

and operator at $4 an hour and scraper rental at $2.50 an hour, was 41¢ a cubic yard.

Present rental of the machines, as voted by the supervisors, is $2 an hour, and a minimum of $10 a day.

The cost of land smoothing, not a precision job, but with some preliminary survey work, averages $20 to $25 an acre. Land grading, a precision job, averages $40 to $45 an acre.

The best size tractor for hauling both pieces of land-smoothing equipment is a 3-4 plow. Smaller tractors have been used, but it takes longer to do the job. As farmers replace their tractors, they are getting larger ones with two-way hydraulic systems, in order to make better use of this equipment.

Problem areas where this equipment is used usually have a field slope ranging from 0 to 4 percent. A contour map is essential to the layout of the smoothing operation, especially to locate ditches so that water does not travel more than 200 feet; and it is important to do a good job of engineering before construction starts. Checking is necessary from time to time while the job is being done. On fields with grades under 1 percent, all water entering the field should be intercepted and carried off by ditching around the field.

By using land smoothing and land grading, a complete conservation job now can be done at one time, instead of piecemeal jobs. Roland Hemond, dairyman, Minot, was so impressed with the benefits of land smoothing that he bought a land leveler for himself.

Examples of successful results from land leveling in Androscoggin and Sagadahoc counties are the rule, not the exception. For instance, Charles Meade, district supervisor and dairy farmer of Auburn, increased hay production on a hard-to-work 15-acre field from only about a half a ton an acre to better than 3½ tons. At $5 a ton for standing hay, a $45-an-acre leveling cost has been repaid in a little more than 3 years.

By using conservation practices, including leveling of 18 acres with the district's machine, Harold Libby, South Auburn dairyman, was able to change the pattern of a flat, wet field from hard-to-farm narrow beds to easier to operate ditch spacing of at least 200 feet.

"We had no sooner finished seeding the field when a 6-day rain came," Libby reported. "After the rain, there was no water standing on it, and there had been no washing."

Libby was the moving force of a neighborhood group of six South Auburn farmers who clubbed together and bought a scraper in 1961.

The winter of 1958-59 in Maine caused a great deal of alfalfa winterkilling, but where the leveler had been used, there was little or no winterkilling. Harold Souther of Livermore, for example, had only 5 percent winterkilling on a 7-acre, land-graded field, compared with 90 percent kill on the rest of the farm, which, he said, "I'm going to level as fast as I can."

Long-time District Cooperator Nathan Morris of Turner, who was 1960 State of Maine and New England Green Pastures and Winter Program winner, is another satisfied user of the land leveler. By leveling in 1959 and 1960, he was able to solve his water-management problem and get his hay in early for good quality, because of the ease and smoothness of getting over the land with farm equipment in the spring.

After leveling 25 acres, Manager John White of one of Auburn's largest privately owned dairy's farming operations said: "We would not plant or seed a field without using the land leveler."

Advantages White listed include: Less operational and breakdown time consumed, and lower cost per acre; more comfortable, safer, and easier operation for such equipment as hay conditioners, tedders, balers, and wagons; opening of many fields to farming operations in wet seasons; elimination of wet spots that grow up to weeds and grasses; and improved yields of better forage.

As a result of this pioneer work in the Androscoggin Valley district, interest in land smoothing has developed throughout Maine. Four other districts now have levelers, two have scrapers, and several others are considering buying such equipment. The University of Maine at Orono leases a leveler from a manufacturer. A demonstration school, attended by district supervisors, 4-H Club members, Vocational Agriculture students, and others from all over the State, was held in the spring of 1959 on the farm of Supervisor Lionel Ferland at Poland.

Alfalfa seeding on leveled field 6 weeks later.

One Hay Crop Pays For Conservation Improvement

By Wayne Sanderson

IMPROVED water management enabled Wayne Luben to harvest more than 300 tons of high-quality hay last year as compared with only 187 tons of poor-quality hay produced in 1955 on his White River ranch in the Lower White River Soil Conservation District in Colorado. And he thinks he can double that yield by leveling part of his meadows.

The first year after Luben bought the ranch, he found his native hay meadows under 2 inches of water, and was always getting his equipment stuck in wet fields. What hay he could mow would not dry out. He was short of winter hay, and there was not enough spring-fall pasture to balance his operation. The previous owners had been plagued by the same problems and had sold the ranch rather than fight them any longer.

Soil Conservation Service technicians assisting the district figured that underground drains probably would be practicable. In 1956, Luben put in 4,600 feet of tile on approximately 100 acres. Cost of laying the tile from 4 to 9 feet deep was $5,400, including Agricultural Conservation Program cost-sharing.

The first summer after the work was done, it was possible to irrigate the meadows properly. Luben followed other SCS recommendations, including proper use of fertilizer and improved water application, all a part of a complete soil and water conservation plan. Each spring he overseeded with bromegrass and clover, until the forage composition gradually changed from sedges and rushes to highly palatable meadow grasses.

Last year, best in the history of the ranch, the increased hay yield was more than enough to pay for the entire improvement program, and Luben had adequate spring-fall pasture to boot.

Note:—The author is range conservationist, Soil Conservation Service, Meeker, Colo.

Modern machinery lets the womenfolk in on the haying.

Harvesting Wayne Luben's 300-ton hay with multiple equipment.

◆

"Horace Greeley, Esq., editor of the N. Y. *Tribune*, recently attended a trial of Plows and Mowers on the 7th of July last, at Guignen, the 'Imperial' College of Agriculture, some 25 miles west of Paris. He says:—'A great number of Plows were tried here, and that of the Messrs. Howard, from Bedford, England, was pronounced the most effective. There was no Plow entered from our country, but one from Canada was tried and did good work . . .' "

—SCIENTIFIC AMERICAN, August 1855

Desert Spring Development—

Indian Ponies to Dozers

By Ralph E. Bishop

NOMADIC Indians are said to have discovered that water could be obtained in desert foothills of the West by walking their ponies back and forth at the foot of a rock ledge below a mesa or high valley. Naturally impounded water, leaking through fractures in the rock, came to the surface through compacted sand.

Time and drought years eliminated most of these seeps; but some of them, in favorable locations, still are usable sources of water in a country where no others exist.

Lewis Massie in the Borrego Valley Soil Conservation District is one landowner who is using desert springs as the source of stockwater and limited irrigation water supply to develop a small retirement ranch where he can keep a few head of cattle, have a small orchard, and provide an ideal environment for wildlife and recreation.

His 160-acre ranch lies in an isolated valley in eastern San Diego County, Calif., between 4,000-foot high Montezuma Valley and 800-foot high Borrego Valley. Massie figured that 30 acres could be irrigated if he could find enough water. Seeps looked promising. Free water on the ground in a few locations and some marshy spots indicated leaks in the "bucket" formed by the Montezuma Valley above.

Note:—The author is work unit conservationist, Soil Conservation Service, Escondido, Calif.

Stock tank filled with seep water.

With help from the Borrego district, Massie went to work on the seeps. He and Soil Conservation Service technicians checked the wet spots, and prepared a farm plan calling for development of three of the most promising seeps and for building storage reservoirs.

Those early-day Indians undoubtedly would marvel at the white man's way of opening the seeps by using modern machinery and materials.

First, a small bulldozer leveled the site for a cutoff trench and concrete block reservoir. A half-moon-shaped trench was dug across the slope near the top of the seep area. Solid material was reached at a depth of 10 feet, and two spots were located to set 24-inch perforated pipe collector units. These were joined by closed tile to a distribution box at the lower end of the trench.

Two $1\frac{1}{2}$-inch galvanized pipes carry water down the slope to a reservoir and a stock tank. Cross hookups are provided in the pipe system, to deliver water by gravity to either unit. The reservoir will be used to supply supplementary irrigation in the valley below when Massie's development is completed.

Two more seeps were developed above the homesite, using the same bulldozer-leveling and other techniques, except that no cutoff trench was needed. Perforated pipe carries the water to a concrete box, the difference in elevation providing the necessary pressure.

Mrs. Johnnie Massie turns on desert spring.

Total output is about 15 g.p.m. continuous flow, and it may get better after a few favorable rainfall years. The water is free, too, after taking off installation costs, which added up to about $1,000, including those for pipe, labor, concrete block for the reservoir, and operation of machinery for excavation. Equivalent water bought from an irrigation district would cost $50 a month, or more.

Several more springs on the Massie property appear to be suitable for development. He plans on having enough water to provide a limited additional supply.

◆

The foundation of farm profits is soil fertility.

New Conservation Technologies Work In New State

By Archibald E. McCabe

BROTHERS Ernest and Jordan Ramos and young Clarence Gomes as their protege in the Mauna Kea Soil Conservation District can show mainlanders a thing or two about overcoming land-clearing and other difficulties to develop successful soil and water conservation ranch programs.

They operate on the Island of Hawaii in the semi-tropical east "Hamakua Coast" area, with its yearlong trade winds, rainfall varying from 60 inches a year along the ocean to 150 inches at 3,000-foot elevation, and deep, well-drained soils developed from volcanic ash (Humic Latosols). Nine plantations owned by three large companies are raising sugarcane on 72,000 of the district's 934,000 acres, and there are four livestock ranches with acreages of from 20,000 to 265,000 acres; but most of the land operators, like Clarence, live on small ranches and vegetable farms.

In the Polynesian days before their discovery by Captain James Cook in 1778, the Hawaiian Islands supported a lush growth of trees, ferns, and grasses, but few native species remain today. Cattle, sheep, and goats introduced by Captain George Vancouver in 1792 and protected against slaughter for 30 years by King Kamehameha I destroyed the native vegetation in many sections. Next, large forested acreages were cleared and planted to sugarcane and other crops. Trees, grasses, and shrubs that later were introduced forced out most of the remaining native vegetation, except for the koa tree, from which the native Hawaiians made their canoes, and the ohia (the red-flowered "rain tree") in protected forested areas.

When 8-year-old Clarence's father died, the Gomes ranch lands were not completely developed and could not provide the large family a living. At 15, the Honokaa boy was living and working on the Ramos Brothers' ranch to help support his family while he attended high school. From them he learned about cattle ranching and the importance of good conservation practices. He used his leisure time and spare money to develop the home place, with the help of his brothers and sisters.

The Ramos Brothers' and Gomes' ranches are in a section receiving about 120 inches of rainfall a year, and are well suited for tropical pastures. The Ramos ranch was once a coffee plantation; but, when coffee prices declined, the fields were left unharvested and later cleared for pasture. While idle, the land soon grew a dense stand of guava 10 to 15 feet tall, and it was necessary to use crawler-type equipment with dozer-rake attachments to clear it. The cleared land then was

Note:—The author is work unit conservationist, Soil Conservation Service, Honokaa, Hawaii.

Clarence Gomes and brother in Pangola grass paddock.

disked twice, allowing time between for organic material and grass residue to decay.

The Ramos brothers planted all their pastures to pangola grass and big trefoil (Lotus uliginosus), and graze their pastures rotationally, with 7 to 10 days on and 40 to 60 days' rest. Paddocks are mowed once or twice a year to remove overmature grass and to prevent the return of brush.

By 1957, Clarence, turning 20, was ready to ask the Mauna Kea district for its Soil Conservation Service technical help in working out a plan for the Gomes ranch, part of which had been planted to kikuyu by his father, with a good stand now established. The rest of the Gomes land was in trees, brush, and poor Hilo, carpet, and rattail grasses and would have to be cleared, disked, and planted. There were no division paddocks, and there was a stockwater problem.

First, Gomes rented the Ramos' equipment for clearing and soil preparation. Then, with hard-earned dollars, he bought $10-a-bag pangola grass, which he and his brothers and sisters planted on Saturdays and Sunday afternoons. Next, his plan called for introducing legumes. Again, with equipment help from the Ramos brothers, Clarence hit upon a unique method for establishing big trefoil and Desmodium intortum clover by sprigging. He used a cultivating machine with a rolling coulter, followed by a shoe-type plow to open the sod and to form contour furrows in both the new pangola grass and in thick kikuyu sod. The sprigging was followed by application of nitrogen and phosphate fertilizer.

Everything grew, especially the pangola, which was waist high when Clarence turned in his cattle. The trefoil and Desmodium intortum took hold and is spreading to areas between the sprigged strips. After the home place was improved and ready for grazing, Clarence, a 1958 champion bull rider, bought his entire cattle herd from savings,

Clearing guava on Jack Ramos land for planting Pangola-trefoil.

augmented by raising pigs at home.

Probably most important is the management that Clarence is using. He subdivided the pasture into 3 paddocks, with the fences located so each has water from a running stream. Grazing is timed to provide the most palatable forage. Young Gomes usually buys weaners and sells the beef as long yearlings on the local market. His average stocking rate is one head to 1.3 acres, with gains averaging 1 to 1½ pounds a day. The stock also has access to molasses supplement yearlong.

Pangola grass pastures are especially popular throughout the islands, where this grass is adapted. Some of the large ranches, like the Princeville Ranch on the Island of Kauai, have improved on the old hand-sprigging methods of planting. This ranch bought a Bermuda sprig planter, attached fertilizer hoppers, and planted in well-prepared seedbeds. Recently, it successfully tried a new and more economical method of harvesting a field of mature pangola with a forage harvester, spreading the planting material with a manure spreader, and following up by broadcasting fertilizer and disking lightly.

Clarence Gomes doesn't claim to be the first or the most outstanding cooperator in Hawaii or in the Mauna Kea district. But he does know that many more acres can be made to produce considerably more for the local Hawaiian food market than they are producing now—with hard work, district technical help, and encouragement and help from family and friendly neighbors such as the Brothers Ramos.

Highways to Dam Floodwaters

An agreement to use State highways as dams for impounding floodwater where it is feasible to do so has been entered into by the Kansas State Highway Commission and the Kansas State Soil Conservation Committee. When a highway is to be built through or in a county, the Commission will notify the State Soil Conservation Service office, which then will inform the soil conservation district board in the county. From then on, all arrangements and agreements will be between the local district and the highway commission.

Made-Over Machines Work

By Gerald M. Darby

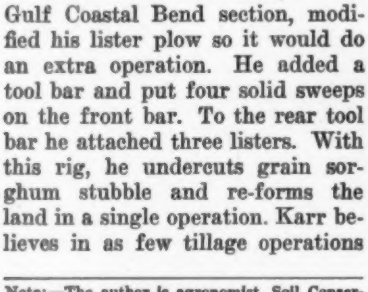
YOU can't top the American conservation farmer for ingenuity in devising special machinery to meet his needs.

Take, for instance, William Cude, the Bee Soil Conservation District's outstanding farmer for 1960. Cude's 4-row tool bar planter, which did a fine job on level land, did not plant to his satisfaction on terraced or uneven land.

Cude went to work and came up with a planter with each drill foot on a flexible coupling linked with its neighbor by cables and pulleys. When one foot is raised by an uneven place, the cables put compensating downward pressure on each of the others. That way, Cude gets a uniform planting job, no matter how rough the land.

Calvin Karr of Sinton, in the Gulf Coastal Bend section, modified his lister plow so it would do an extra operation. He added a tool bar and put four solid sweeps on the front bar. To the rear tool bar he attached three listers. With this rig, he undercuts grain sorghum stubble and re-forms the land in a single operation. Karr believes in as few tillage operations as you can get by with, to cut costs, save moisture, and keep the soil in better condition.

At the Picosa farm south of San Antonio, employees adapted a potato harvester for gathering and loading roots of bermudagrass, which has become one of the important conservation plants in most of Texas. Roots are planted by the thousands of tons each year in developing high-yielding pastures. Bermudagrass harvesting still is a 5-part job in most places. On the Picosa farm it involves only three operations: Mowing the grass, raking the hay, and digging the roots and loading them in a single operation with the made-over harvester while they are at their best.



Bill Cude and his constant-depth planter.

Harvesting coastal bermudagrass with potato harvester.

At two plant materials centers operated by the Texas Agricultural Experiment Station in cooperation with the Soil Conservation Service, employees needed an implement to cut and collect grass seedheads in one operation. James E. Smith, Jr., helped to make over a damaged combine for the task. The station crew took off everything except reel, bats, sickle, feeder canvases, engine, and wheels. They added a big dump bucket. This did the job.

Calvin Karr's "tandem lister."

These are only a few of the examples of the Texas conservation farmers' and technicians' knack for improvising equipment with which to get the conservation job done. Farmers frequently find it necessary to improvise machines of this type to meet immediate needs, even though machines which will do the same thing may be available commercially, because they are not available to the individual at the time.

Note:—The author is agronomist, Soil Conservation Service, Austin, Tex.

◆

A yield of 100 bushels of corn, plus the stalks producing it, contains about 160 pounds of nitrogen, 60 pounds of phosphate, and 120 pounds of potash. Part of this can be supplied by the soil, but the farmer should put back into the soil at least as much phosphate and potash as he takes away in crops harvested. The most effective way to determine fertility needs is by a soil test.

In spite of the general trend of U.S. farmers to use greater amounts of fertilizer, there is considerable evidence that they do not use amounts that would give them highest returns.

Picking Rocks Easier With Steel Fingers

By Edward Konieczny

POWERFUL stone rakes with strong steel teeth or "fingers" are saving wear and tear on human fingers in the traditional chore of picking stones from New England fields.

Such modern machine methods of doing the major part of this back-breaking job that faced the earlier settlers and succeeding generations of farmers on the hilly, stony soils of this area have become increasingly necessary in recent years of conservation farming with its emphasis on growing improved grasses and legumes for pasture and hay. The land must be workable so it can be plowed, fertilized, and seeded.

As Manager Robert Potter of Raymond Flagg's 150-acre Green Hill Dairy Farm in Gill, Mass., puts it, "Pasture is only as good as you make it."

Eight years ago, they decided to improve 20 acres of unproductive pasture as part of their soil conservation plan worked out with the Franklin Soil Conservation District. Soil Conservation Service technicians confirmed that the soil on the pasture was a good legume and grass soil, but stones were the chief obstacle to preparing a seedbed for growing alfalfa and Ladino clover.

Note:—The author is work unit conservationist, Soil Conservation Service, Greenfield, Mass.

Alfalfa and Ladino clover on rock-free pasture.

A private contractor with a 20-ton tractor equipped with a "rock rake" was hired to clear the rocks from 5 acres of the stony pasture. The clearing operation could be compared to mowing a hayfield, as the tractor lowered its rock rake and combed out the stones a swath at a time. Those removed on land adjacent to the roadway were buried, to avoid leaving unsightly piles of rock, and the others were placed along existing stone walls.

Potter said that part was easy; the hard job was still having to handpick the stones that slipped out between the teeth of the rock rake.

After the land was cleared of rock, lime and fertilizer were applied, and the pasture was seeded to rye. The rye helped to smother weeds, provide almost immediate feed for the cows, and smooth the roughened land surface. After the cows harvested the rye, an alfalfa, Ladino clover, timothy mixture was seeded. The result was four times more excellent quality pasture than this land previously produced.

Additional acreage was cleared each year until the 20-acre field was completed. The pasture then was subdivided into 4-acre lots for rotation grazing, and now supplies excellent feed for 50 dairy cows. When they have grazed one of the lots, the pasture is mowed and fertilized, to keep young, succulent plants growing for additional feed.

Flagg likes the conservation pasture improvement because, when the high-quality legumes and grasses run out, the field can be prepared for reseeding without interference from stones; farm equipment can work the field easily and without breakage; and high-quality pasturage keeps milk production at a high level. Instead of picking around hardhack, juniper, and moss growing among stones, his cows now can eat their fill in improved pasture.

One type of rock-combing equipment.

Stripcropping

The Agricultural Research Service and the Virginia Polytechnic Institute have concluded that contour strip-cropping, as of corn alternated with grass and small grains, is one of the most potent weapons in the fight against soil erosion.

Their studies on water and runoff rates were started in 1939 on a 19-acre tract at Blacksburg, Va. Stripcropped, this area had a runoff rate of 34.5 cubic feet of water a second, when exposed to rains measured at the rate of 6.6 inches an hour. When row-cropped, not on the contour, and exposed to rainfall of only 2.2 inches an hour, or only one-third the amount on the stripcropped land, the runoff amounted to 37 cubic feet of water a second.

Plows To Fit the Land

By Gera[illegible] Ry[illegible]

WHEN the first plowing match in the United States was held in Illinois in the late 1870's the prize went to the plowman who could turn the straightest furrow on level land or up hill and down. His plow was drawn by horses.

It was to be nearly half a century before tractor power was to start coming into any general use —on only 3½ percent of the country's farms as recently as 1920. And it was to be another two decades before enough American farmers had learned to work with the land, not against it, that contour-plowing competition was introduced into the by that time traditional matches of skill on plowing-contest fields.

We have come so far in fitting our tillage and other implements to the land since the 1870's, since the 1920's, and even since the 1940's, that it is hard for conservationists and progressive farmers in the sixties to remember that it was not always thus. A less recognized fact is that while we have been fitting our tillage and other farm machinery to the land, we also have been in still more recent years shaping our land more and more to multiple-row and other modern farm machinery. It has been a two-way evolution.

From the earliest days of the soil and water conservation movement in the early 1930's, there has been the closest possible relationship between the tillage and other farm practices which farmers found it to their advantage to adopt and the machines they used to till and plant the land.

The first decade of Soil Conservation Service's operations was more or less a period of inventory taking, during which the need for change in tillage practices was analyzed. Many were tried out on erosion-control demonstration project, Civilian Conservation Corps, and early soil conservation district cooperators' farms, and on State and Federal experiment stations, to learn what needed to be done to land to control erosion. Many early practices were found ineffective or impracticable. Others showed promise and went through a gradual process of improvement and adaptation to crops and to soils, as well as to farmers' operational needs.

In this process, it was inevitable that we should find, as we did at the LaCrosse, Wis. Cooperative Erosion Control Experiment Station and elsewhere, that the farm machines which long had met the needs for conventional practices were not nearly as adapted to the new conservation practices as they needed and eventually had to be.

Thus the needs of soils for protection from erosion, the protection afforded by new or modified tillage practices, and the operating characteristics of machines necessary to make those practices practical all were analyzed.

Terraces, stripcropping, and contour farming all dated back to the

Mule power.

Note:—The author is head of the administrative services division, Soil Conservation Service, Washington, D. C., and formerly was research engineer and conservation equipment specialist, successively.

Land To Fit the Plows

By Gera Ryerson

days of animal-drawn small equipment. Narrow, crooked terraces or strips had not been a serious impediment to that kind of farm machinery.

Problems which arose as we passed out of the period of inventory taking, and the effectiveness of new practices, began to be evident. An important contributing factor was the highly mechanized, newly efficient agriculture which developed during the World War II period. Increased farm production and the erosion damages which resulted intensified the need for conservation, and more and more farmers adopted conservation systems.

Hundreds of thousands of miles of terraces were built, grassed waterways were established as terrace outlets and to control gullies, and more and narrower strips were installed. Mulch tillage, better sod-based rotations, and many other measures began to come into use. In the meantime farm machines had grown bigger, and tractors more powerful and faster, but they still needed to be better adapted to conservation farm operations for which they as yet were not designed.

Drastic changes both in farm machinery and in conservation practices were made by the early fifties. Terrace design had to be altered so the new implements could be used on terraced fields. The curves in strips and contour operations likewise were softened considerably. Various other improvements were worked out to make it practicable for the farmer to use his new machinery on conservation-treated fields.

Tractor power.

Farm machines themselves also underwent a great change during this period. Even though it was likely that hydraulic controls, mounted equipment, and more versatile tillage tools all eventually would have found their place, because of their labor saving characteristics, the need for protecting grassed waterways almost certainly brought about earlier adoption of hydraulic controls. Field cultivators which would operate through crop residues and still perform needed tillage operations without clogging became common. Farming of terraced fields was a factor in bringing about the use of mounted equipment providing more precise control on side hills and in curved rows.

Over the years, the SCS and the farm equipment industry have cooperated in studying problems of developing machinery to meet the needs of conservation farmers. A Dealer-District Program initiated several years ago was effective in bringing about a better understanding by dealers and manufacturers of problems of district farmers in applying conservation on their land, and by both farmers and dealers of the adaptability of their equipment to conservation farming.

Later on, terraces were modified still further to provide side slopes which fit the multiple-row equipment in common use by that time. Still later, as we learned how to modify terrace shapes and aline-

ments, we could move field soil without destroying its productivity, thus making possible the development of parallel terraces. Terrace spacings were arranged to fit a multiple of the width of the machine selected. The shape of the terrace was adapted to the machine the farmer planned to use.

Land-leveling, land-smoothing, or land-forming operations originated in the irrigated areas as a means of distributing irrigation water more efficiently. Farmers in the humid areas soon learned that smoothed fields also resulted in better surface drainage, and leveling became an increasingly common practice for this water-management purpose. Soon after other farmers learned that this operation would permit them to utilize the speed now built into farm machinery more effectively and to use wider machines, land leveling became a common practice in many areas across the country. It now is possible for a farmer to reshape his land to adapt it more fully to the kind of farm operations he chooses to follow, permitting him to utilize speed and efficiency built into modern farm machinery. Along with his more efficient tillage operations, he can develop a fertility program adapted to the needs of his soils and crops, thereby completing the cycle of fully adapting both the machines and conservation practices to the needs of the soil and most efficient and economical farm operation.

These conservation developments have given rise to the need for tremendous earthmoving operations in agriculture. Although farmers have tractor power and the equipment to build terraces, dig farm ponds, shape waterways, and to perform many of the other conservation earthmoving operations, many have found it more economical to hire earthmoving contractors while they themselves concentrate on their regular farming operations.

To meet this need, a large number of farm earthmoving or land-improvement contractors, equipped to do the hitherto unthought-of or "impossible" jobs now so commonplace, have moved into the conservation field within the last 10 years or so. Although they are mostly 1- or 2-machine operators, at least when they start out, some have sizable outfits with various types of equipment. It is not known how many conservation contractors are operating at any one time, but it is believed there are about 20,000 small contractors in agricultural earthmoving alone.

In view of the magnitude of the job ahead, it is expected this will be an active field for years to come. SCS records show, for example, that farm earthmoving jobs alone have involved approximately 500 million cubic yards annually for the past several years, not including work in flood-prevention programs.

"You Can't Level That Land"

But Idaho Farmer Did

By Eugene F. Crisman

"YOU can't level that land!"

That is what Wayne Naugle of Nampa, Idaho, heard from all the oldtimers when he bought a 240-acre farm in the Boise River bottom, but he had other ideas. After starting work on the farm in 1957, however, he wasn't too sure that the oldtimers were not right.

"I almost bit off more than I could chew," Naugle admitted later.

Because the land largely is rough, shallow, gravelly, wet, and salty, most of this area lies exactly as it did when first taken out of sagebrush in the late 1800's. When the brush was cleared, ditches were run on the ridges, and the water was spread until volunteer bluegrass came up.

Naugle originally leased the farm in 1955, but after two years of irrigating he decided it needed considerable improvement to increase the carrying capacity and decrease irrigation problems. These included elimination of low areas of stagnant water that were breeding spots for snails which cause liver flukes in cattle. He decided it would be far better to buy the land and improve it the way he wanted it.

Note:—The author is work unit conservationist, Soil Conservation Service, Nampa, Idaho.

This is what most of Naugle's 24-acre farm looked like before leveling.

Naugle inspects ditch before it is lined.

Working through the South Canyon Soil Conservation District, of which he is a director, Naugle drew upon the assistance of Soil Conservation Service technicians in laying out his farm. Land leveling and drainage were the two big problems.

Leveling was needed to get rid of the gravel bars and to smooth up the land so the salts could be flushed out. Drainage was necessary to get the water out of the low areas. Because of the large amount of work to be done, Naugle decided it would be cheaper to buy a bulldozer and carryall, do the work, and then sell them.

The first gravel bar Naugle and his helpers attempted to move turned into a four-week job, for the original area covered about six acres. The gravel was spread in the low, wet areas that were difficult to work; and when these were filled, trenches were dug down to gravel in the deeper soil. The good soil was stockpiled, and the trenches were filled with more gravel, after which about 12 inches of soil was respread over the gravel. The same process was used in undercutting the other gravel bars and bringing them back up to grade.

By 1959, Naugle had leveled 100 acres and dug 1¾ miles of open drains with SCS engineering help made available through his soil conservation district.

When the leveling and drainage had been completed, the job actually had just started, however; for then came the tedious task of establishing a good pasture grass on the salty soil. With the water table lowered, the soil was flushed of as much salt as possible before seeding. Then the grass was seeded at the rate of 16 pounds an acre. The land was irrigated frequently but lightly until the grass was established.

The upshot was that Naugle then had a pasture consisting of ladino clover, smooth bromegrass, orchardgrass, and alta fescue that would make any man envious. Forty acres were seeded in 1957, 15 acres in 1958, and 95 acres in 1959, with 35 acres more planned to be seeded, for a total of 185 acres of improved pasture. The remaining 50 acres will be left in native bluegrass for the cattle to feed on in the winter. Naugle planned to run about 350 head of cattle on the farm. When he bought the land, it would barely support 150 head!

Pasture of bromegrass, orchardgrass, alta fescue, and ladino clover after water management and leveling work was completed.

A well-planned pasture management and fertilizer program has helped make this production possible. All manure is spread on the pastures, and check plots are used to determine how much commercial fertilizer is needed for best results.

Naugle's plans called for building concrete-lined ditches along the heads of the fields to reduce water loss and facilitate irrigation, and installing gates in the ditches for border irrigation.

Lining a ditch with concrete 2½ inches thick to prevent winter cracking.

All hay and ensilage will be raised on Naugle's other farms; so no feed will have to be bought, and this entire farm can be used for pasture.

"Sure it cost a lot," Naugle said, "but even if I add up the original price and all the money I spent on it, I could sell the farm for more today than I have invested. Besides, if I hadn't done it, where could I get pasture as good as this?"

◆

West Berlin's 1,500 horse population is reported increasing 3 percent a year.

South Dakota Earth Moved in Year Would Build 30-Mile Dam

By C. D. Brehm

IF all the earth moved by South Dakota's conservation farmers in 1960 could have been put in one pile it would have made a 30-mile-long dam 30 feet high and 165 feet wide at the base.

In other words, there were approximately 16 million cubic yards of earth moved, much of it with heavy equipment, in building stockwater ponds and dugouts, terraces and diversions, in water-spreading and water-management systems, and in land leveling for irrigation.

Farmers and ranchers cooperating with South Dakota's 67 soil conservation districts, with the help of Soil Conservation Service technicians assigned to them, consequently have become one of the largest earthmoving groups in the State. And they have only started.

More conservation work is being done each year, with increasing attention to terraces, with waterways. Terracing, to control soil erosion and make efficient use of moisture, is a relatively new general practice in South Dakota. It pays well, especially in dry years. South Dakota farmers are moving about 2 million cubic yards in their terrace building a year. Waterways, to carry surplus water without harm to natural stream courses, are a must with terrace systems. They involved some 400,000 cubic yards of earthmoving a year.

Water spreading on range is another conservation practice getting increased attention in the central and western parts of the State. Farmers and ranchers moved 300,000 cubic yards of earth in building water-spreading diversion dams and dikes, to make it possible for more water to soak into the grasslands and improve yields.

They also moved 12 million cubic yards in building stockwater dams and dugouts, to assure better water supplies for cattle and sheep, and supplemental supplies for irrigating hay crops. Detention and irrigation dams, irrigation ditches, and erosion-control work meant the

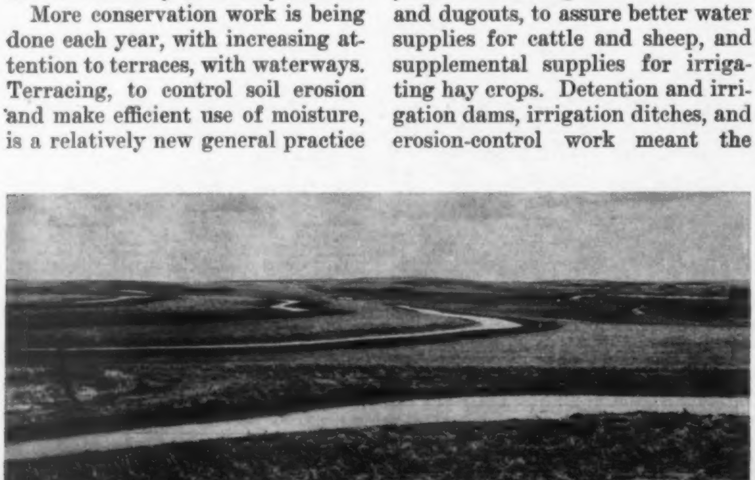
Building level terraces with elevated terracing machine on M. V. Klienjon farm in Brookings County.

moving of 750,000 cubic yards.

Another 550,000 cubic yards were moved in stepping up efficiency on irrigated lands. This practice pays in uniform crop yields, in less waste of water, and in better disposal of excess water.

Conservation contractors have played a major role in this conservation earthmoving. Most of them own only two or three pieces of equipment, but they operate most of the year. A considerable amount of the work, of course, was done by the farmers and ranchers with their own equipment. Equipment includes tractors and carryalls, draglines, road patrols, terracers, and bulldozers, as well as farmer-owned plows used in terracing.

The Great Plains Conservation Program has accounted for a noticeable amount of the quickened interest in western areas of the State. This program offers Federal



Martin Stovevik's level terraces in McCook County holding first spring's runoff water.

Note:—The author is State conservation engineer, Soil Conservation Service, Huron, S. Dak.

cost-sharing to help farmers and ranchers do a faster job in getting complete soil and water conservation on the land.

Drought in the Northern Plains in 1961 and other years has caused many farmers to take more interest in conservation, after observing that neighbors using soil and moisture conservation practices have been able to make it through with water and grass for their livestock. Structural and other measures involving earthmoving are among the cropping, tillage, grass planting and management, tree windbreak planting, and other conservation practices they are using to help protect their land from drought or flood and to keep it fit for more stable production year after year.

Stockwater pond and good grass on Gruenwald Ranch, Beadle County.

Youth Conservation Is Watershed Project By-Product

By Sellers Archer

GIRL scouts from five north Georgia counties live it up in the summer because of a watershed protection and flood prevention project developed on Sautee Creek by landowners with Soil Conservation Service and Forest Service help.

An 18-acre lake, which is used by the Yonah Girl Scout Council serving 1,300 girls and 400 adults, is one of five that will protect the Nacoochee Valley and its prosperous farms from damaging floods that have averaged one a year. A stream of water flows out of a pipe under the earthen dam. When storms come, water now will rise above the pipe opening that controls the normal pool level, and automatically be released slowly enough that the stream below will not overflow.

On the lake banks are the central building of Camp Echoee, a combination dining and assembly hall, PX, infirmary, warehouses, and other buildings. Scattered over the hillsides are camp units with tent and outdoor cooking and eating facilities. Canoes tie up to docks built out into the water, and swimming areas are fenced off. Land for the camp was donated by Dr. Austin Walters, a retired Navy doctor, after the watershed plan was completed and the flood-detention reservoir site was definitely located.

The camp director's staff includes a waterfront director, a dietitian, a registered nurse, and qualified teachers of campcraft and cooking, arts and crafts, Indian and nature lore, folk songs and dancing, and health and safety. The girls also have a chance to learn to fish, because bass and bream big enough to be caught have been stocked in all of the watershed lakes. The American Camping Association gives the group a high rating.

The 35-acre Lou Henry Hoover Memorial Wildlife Sanctuary, on adjacent national forest land, is under a 10-year development plan. Three miles down the road is Camp Sky Lake, which accommodates 200 Jewish boys and girls from all parts of the Nation. This lake rapidly was losing its capacity because of sedimentation until the watershed project was established. One of the flood-detention reservoirs is just above the camp. It protects the old lake and provides more water area for boating and fishing.

Girl Scouts enjoy swimming and canoeing behind watershed project dam.

Note:—The author is field information specialist, Soil Conservation Service, Spartanburg, S. C.

Strip-Mine Land *Can* Be Salvaged

By Encil Brohard

TO look at strip-mine land, you would think nothing would grow on it, as it very often doesn't. Such gouged-out land usually is left hard, dry, compact, sour, sandy, shaly, void of humus, and rocky—to name a few of its minus qualities. Yet, with all this, strip-mine land is interesting, unpredictable, fascinating, and promising of salvage for future productive use. Revegetation has been done in a variety of ways in the Northern Panhandle Soil Conservation District in West Virginia by the farmers and coal operators, with Soil Conservation Service technical help.

Sourness is a major problem. In some cases, where the soil was tested for acidity soon after being graded, it tested only moderately sour and was considered suitable for planting; but after it was exposed to the air and sun for a few weeks, the soil became very sour, because of oxidation of sulphur compounds. Any trees planted promptly died, and the area remained completely bare of vegetation, including even the hardiest weeds.

Note:—The author is work unit conservationist, Soil Conservation Service, Wellsburg, W. Va.

Contour furrowed strip-mine area and tree planting, with pond.

May seeding in July on Chill Reed farm, Colliers, W. Va.

As a result of these experiences, such areas commonly now are left unplanted until conditions for plant growth become more favorable; because, under normal conditions of moderate acidity, many kinds of weeds, locust, and other vegetation "seed in" to try to cover the strip spoil. To help combat this "sour" condition, only the top, or surface, is worked in preparing a seedbed. Where grass and legumes are to be planted, the seedbed is prepared by harrowing, rather than plowing, to avoid bringing acid soil to the surface. Because of poor structure, the soil usually is hard, dry, and compact after being leveled by a bulldozer, and trees grow more slowly on the leveled portions.

A "sweet" strip-mine spoil can be vegetated much more readily. There are a few areas in Brooke and Hancock Counties, for example, where, in the process of grading, the sweet, limestone soil was left on top. Where seeding was done on this type of spoil, a successful stand of alfalfa and grasses usually resulted, with the application of 600 pounds of 10-10-10 fertilizer to the acre. In rare cases, volunteer clover stands appear on sweet spoil, making a good land cover.

The planting of trees usually is recommended. However, sweet spoil or slightly acid spoil occasionally is planted to legumes and grasses. Some spoil is too steep, rough, and rocky even for planting tree seedlings. Such areas are seeded, preferably with black locust and sericea lespedeza. Among the seedlings, locust, short-leaf pine, Scotch pine, and white pine have shown the most promise, with black locust making the most rapid growth. Autumn olive appears to be the most promising shrub, coupling fast growth and heavy production of fruit for wildlife.

Some of the areas in Brooke and

Hancock Counties have been contour furrowed for tree planting. Contour furrowing aids in the collection and retention of moisture, resulting in faster growth. However, the looseness of the soil sometimes causes too much soil to build up around the trees, resulting, in effect, in their being set too deep.

In one case, a detailed planting plan was prepared with the help of the Soil Conservation Service for the local soil conservation district; and in some cases, the landowner bought and set his own trees.

In other instances, the seeding or tree planting was done by the coal operators, using specifications from the Agricultural Experiment Station.

The present West Virginia strip-mine law requires the mine operator to obtain a satisfactory stand of plants. It also permits him to make use of soil conservation district services. It has been shown that coal can be mined and the land put back in such a shape for satisfactory production of hay and pasture. For example, Mike Starvaggie, near Weirton, set aside 13¢ for every ton of coal he stripped to a depth of 90 feet, to restore the land to a condition productive enough to farm. These "canyons" were filled and the land seeded to make it the show place of the State and one of the best in the entire Nation.

Representative Citizen

SOIL and water conservation comes naturally to versatile Adolph Hansen of Colorado.

As he puts it: "I was broken in to conservation, and had already rebuilt two farms in Denmark before coming to this country."

He also was on a committee of farmers that started rural electrification on the island of Fyn in Denmark, from which country he came in 1925 as one of several farmers brought to the United States by a beet sugar company. This is believed to have been the first cooperative rural electrification in the world. It was the approach used for later rural electrification throughout Europe, and then by the Rural Electrification Administration in the United States.

Hansen, his wife, daughter, and two sons were located on one of the company farms near Granada, Colo. When the farm was sold to the United States Government in 1942 for use as a wartime internment camp, the Hansens bought a farm 8 miles southwest of Las Animas. The house with which they started out was a stagecoach stopping point on the Santa Fe trail, and will be 100 years old in 1963.

Their son, Niels, bought an adjoining farm, and now leases the elder Hansen's farm since Adolph's "retirement" in 1961 after 65 years of farming. Their other son, Hans, is a chemical engineer, and daughter Karen is a medical doctor.

Adolph Hansen.

With a farm of their own, they started conservation and rebuilding in a big way. Three hundred acres had to have drainage rehabilitation before successful farming could be carried on. This conservation improvement was followed by land leveling and putting in a new irrigation system. The Purgatoire, or Picketwire, River began to move in on the land. This called for building $1\frac{1}{2}$ miles of new river channel.

Hansen became a member of the board of supervisors of the Bent Soil Conservation District in 1943 and has served continuously ever since. While he was board president from 1953 to 1961, the Bent district became one of the most active districts in Colorado. In 1958, it built an agricultural building in Las Animas to house U. S. Department of Agriculture agencies operating in the county.

Hansen was active during the early years in getting the Southeast Colorado Association of Soil Conservation Districts started. This, in turn, led to organizing of the Colorado Association of Districts. He served on almost all of the State association committees.

From 1937 to 1942, he also was on the Farm Security Administration (now Farmers Home Administration) Advisory Committee for seven States, including Colorado, and served as a member of the Bent County FHA board. He

helped organize and was a charter director of the Production Credit Association in La Junta; was president of both the Prowers and Bent County Farm Bureaus and a State director of the Colorado Farm Bureau; and has been on the board of directors of the canal company serving his farm.

Hansen has taken his place in the history of his adopted State. He is listed as one of the "Representative Citizens of Colorado" in the recently published Historical Encyclopedia of Colorado.

—CARL R. WARD

Ditch Lining Saves Water—Pays

By Rex Ricketts

DURING the last 4 years 16 farmers and ranchers in the Fallon, Nev., area have had more than 24,000 feet of irrigation ditches concrete lined on their farms. They are cooperators in the Lahontan, Sheckler, and Stillwater soil conservation districts.

A large percentage of the soils on which farmers raise crops in the Lahontan Valley is sandy. Seepage losses from earth ditches constructed in those light-textured soils can run as high as 30 percent of the total irrigation water lost per mile of ditch. This water not only is lost for needed irrigation, but also adds to the ground-water table. In many cases crop yields are reduced and drainage becomes necessary.

Weeds in ditches are a never-ending problem in all irrigation farming areas, and much time and expense are involved in combating them. With seepage losses, weeds, and extremely flat ditch slopes, the delivery time for irrigation water from main canals to the fields is measured in hours rather than in minutes.

After checking around in other localities to find out how similar problems were overcome, farmers of the Fallon area decided concrete ditch lining was the answer.

Cyril Schank was one of the first farmers in the Fallon area to line an irrigation ditch with concrete. Four years ago, 2,000 feet of concrete-lined ditch was installed by a contractor, using a slipform, at a cost of $1.50 per foot. His old ditch took up a strip of land 2 rods, or 33 feet, wide. The new ditch, banks and all, is only 12 feet wide.

Charlie Frey's homemade slipform laying concrete on ditch side.

The irrigation time on the 40-acre field served by the ditch has been cut in half. A tractor and disk were needed to clean out the old ditch before each irrigation. This maintenance work required 100 hours of man and tractor time. Also, there now are no weeds and no breaks or washouts to contend with.

When the ditch was completed, Schank thought it would take 2 to 3 years for the concrete lining to pay for itself. Instead, he believes the ditch paid for itself in one year. That is because he was able to do a better and more economical irrigation job, and improve his per-acre crop yields accordingly.

Cutting the irrigation-water delivery time from 7 hours to less than 10 minutes is a significant achievement resulting from installation of 1,700 feet of concrete ditch lining by Art Bevan, Fallon

Note:—The author is engineer, Soil Conservation Service, Yerington, Nev.

Graded and staked irrigation ditch before pouring concrete for lining.

Pouring and hand-spreading concrete in a ditch on Ralph Lattin farm.

rancher. Bevan has a 240-acre farm, with 150 acres planted. The old dirt channel ditch went through a sandy area where seepage losses were high, and weeds growing in the ditch slowed the water to a crawl.

As a result of putting in the slipform-type concrete ditch lining, 13½ cubic feet per second can be delivered to his fields with no loss and no weed growth to worry about. The benefits derived from this lining will rapidly defray the installation cost of $2.90 a foot.

"It used to take 64 hours to irrigate my farm," Bevan said, "but now I get it all wet in 24 hours."

A unique homemade slipform for concrete ditch lining was developed by Charlie Frey. He poured 1,800 feet of ditch with it in only a few days. His ingenuity has paid off. The total cost for the concrete lining in place was only $1.70 a foot. A 2-foot ditch bottom was used for this particular ditch; but with slight modifications, any desired bottom width can be built.

As constructed, the lined ditch has a capacity of 30 cubic feet per second. It takes only 15 minutes to deliver water to his back fields. Previously it took several hours. Another ¾ mile will complete the lining program on Frey's 780 acres. When it is completed, water can be delivered rapidly to any part of the farm without loss.

Dennis Sorensen lined 700 feet of irrigation ditch with concrete. The cross section was trimmed to grade by hand, and the concrete lining was hand placed and smoothed. Labor, concrete, and equipment costs totaled $1.68 a foot. The completed ditch will carry 15 cubic feet per second. Seepage eliminated, a 100-foot-wide portion of the field adjacent to the ditch now raises good alfalfa where nothing of value grew before. Sorensen estimates that the hay crops from this field have been increased 10 percent. The ditch doesn't grow full of weeds and require cleaning just when Sorensen is busiest in his hay fields.

Section of 1,800 feet of concrete-lined ditch on Charlie Frey ranch. The ditch has 2-foot bottom and capacity of 30 c.f.s.

Several gunnite and shotcrete linings also have been put in around Fallon. With these methods, the concrete mixture is sprayed on a preformed ditch section. Reinforcement can be used with this type of lining, which is desirable on many jobs. The cost of this lining is comparable to that of the other types.

More and more farmers in irrigated areas are realizing the benefits and values of ditch lining as an aid to using water efficiently and helping them to farm successfully.

Mechanical Post Peeler Leads To Good Land Use

By Richard L. Gray

A LOCALLY designed mechanical post peeler made it possible for ranchers in northeastern Wyoming's Buffalo-Belle Soil and Water Conservation District to convert unproductive Ponderosa pine thicket lands to income-producing areas of their ranch units.

There are many acres of such thick Ponderosa pine stands in this Black Hills area. The owners of these lands have become increasingly concerned over their use, because in their grownup state they provide very limited grazing, and the trees don't grow large enough to log for sawtimber. The result is nonproductive areas on ranches that need all the income possible to make them pay, for most of these ranches are barely large enough for economical operation.

Realizing it would be a real help if these thicket areas could be made to produce, the ranchers considered many ideas and suggestions. Some

Note:—The author is work unit conservationist, Soil Conservation Service, Moorcroft, Wyo.

The mechanical post peeler.

even have run a bulldozer through the thickest places; but this operation leaves large piles of broken up trees to decay, and exposes slopes to wind and water erosion.

Most ranchers could see that posts and poles, for which there is a continuing good market, were the only possible crop they could harvest from this land. Some got out their axes and cut a few trees, usually in no pattern except to take everything usable. Then they took the spade and peeled them. But these laborious hand operations were enough to discourage even the most determined among them.

Unwilling to give up, a group of four district ranchers southwest of Sundance—Kenneth Canfield, Joe Beal, Herbert Finch, and Bob Pearson—decided to see if they couldn't get over the stumbling block of peeling the posts. They took their problem to a local machinist, Merle Sisson, who came up with a design for a mechanical peeler, costing about $600.

After it was built, the four ranchers cut some posts with a chain saw to see if the peeler would work. It did. They then had a chance to sell the machine, at a profit, to a commercial post company over in South Dakota. They promptly had the machinist build them a new and improved peeler.

They still are using this one, which has peeled thousands of posts and poles. They have peeled all they needed themselves and have helped their neighbors. The local telephone company people got together and, in one day, cut, skidded, peeled, and piled 375 poles for a new line to all the ranchers for a new dial system. One rancher later treated all the poles with penta, the method of preventative treatment the ranchers now use, after trying crankcase oil unsuccessfully when they started out.

Sisson has built several machines for commercial peelers in South Dakota and northeastern Wyoming. These peeling machines are driven by tractors or portable engines. The whole unit can be loaded onto a pickup truck and moved anywhere easily.

The peeling is done by a lathe-type cutting knife, which has adjustable depth of cut. Posts or poles are fed through by two rubber tires at a speed governed by the feed handle. Two carts, one on each side, hold the pole or post steady during its turning action while it is going through the machine. It takes three or four men to keep the peeling rig operating at full capacity.

This locally developed tool has led the way to economic land use through a practical conservation practice on these Wyoming woodlands. As a result, the ranchers are able to harvest a crop while doing the thinning that pays them for their time, results in faster growth for the trees that are left, and avoids thicket clearing by bulldozing or other means leaving the land in condition to erode.

Commercial post-peeling machines also are on the market.

◆

The Soil Science Society of America observes its 25th anniversary at the annual meeting of the American Society of Agronomy and Soil Science Society of America in St. Louis, Mo., November 27-30. Dr. Charles Kellogg, assistant administrator for soil survey, Soil Conservation Service, will review the history of the Society at the meeting.

◆

Agriculture is a paycheck every payday for 16 million Americans. They make, ship, and sell tractors, combines, milking machines, fertilizers, fencing, building materials; generate and transmit electricity; refine petroleum or make tires; or in other ways service and supply farmers.

◆

Farm and Home Safety people say be sure to use proper signals and warning devices when driving tractors and other farm equipment on roads.

◆

Proper fertilization doesn't cost. It pays.

$1,000 Orchard Waterway Job Is Paying Off

By W. R. Fibich

BY moving about 5,000 yards of earth at a cost of $1,000 George Pheasant converted an old eroding waterway into a usable part of his 20-acre apple orchard in the Ephrata Soil Conservation District in central Washington.

The Sheep Canyon drain, as it is commonly called, carries runoff water from some 2,000 acres of dry wheat and rangeland, with a heavy flow when snowmelt and flash rains from the watershed concentrate in the creek bottoms. This erosive flow entered the irrigated lowlands by way of a meandering stream which eroded more each year, and the waterway area was covered by sagebrush and trash.

Work on rehabitating the waterway was begun in 1956, with technical help from the Soil Conservation Service through the district. Half the cost was shared by the Grant County Agricultural Conservation Program.

Note:—The author is soil scientist, Soil Conservation Service, Ephrata, Wash.

After the drain was cut to grade, manure and zinc, plus nitrogen, phosphate, and potash fertilizers, were plowed into the soil on the sides and bottom of the waterway. Where the channel had meandered back and forth, the land was cleared of sagebrush and trash and leveled; and 100 pounds of nitrogen an acre, plus many loads of manure, were plowed in.

Pheasant's experience was that the earthmoving should be done in the early spring, in order that a sod of mixed sweetclover and orchardgrass could form in the channel bottom. After the sod was established, thistles and weeds were mowed, because any such obstructions would divert the water from the bottom of the waterway and cause erosion of the sides of the channel.

The rebuilt waterway is about 2,000 feet long and 50 feet wide, and has a grade of 2 percent. It is designed to handle peak runoff of 240 c.f.s. of water, because all caution must be taken to prevent water damage to an expensive crop like apple trees.

Waterway before shaping and seeding.

Results of Pheasant's waterway development with established apple orchard.

Stabilization of the waterway makes it possible for Pheasant to use his sprinkler irrigation equipment over the whole 20-acre field, and to operate his farm machinery across the drain, instead of having to drive around it.

This land now is growing 2,600 4-year-old trees, which already are producing about two boxes of fruit apiece annually. He figures he has developed an orchard that will produce apples to compete on any market.

Pheasant also farms 312 acres of irrigated land, which is in corn, beans, small grain, hay, and pasture, and has 100 beef cows. He believes his new operation will pay for itself in a few years, by proper use of all land on the farm, as well as in soil and time saved.

◆

"John Lane, Senr., the inventor of the steel plow, died at his residence in Lockport, Ill., on the 5th of October, after a brief illness. Mr. Lane emigrated to Illinois in 1833, and in that year invented the steel plow, which is now in general use throughout the West."

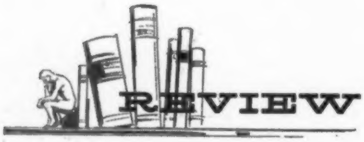
—SCIENTIFIC AMERICAN, November 1857

GOVERNMENT PRINTING OFFICE
DIVISION OF PUBLIC DOCUMENTS
WASHINGTON 25, D. C.

OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE TO AVOID
PAYMENT OF POSTAGE, $300
(GPO)

If your address changes, please notify us of your complete new address, including zone or RFD number, and include old address with our code number as shown above.



INTRODUCTION TO SOIL MICROBIOLOGY. By Martin Alexander. 472 pp. Illus. 1961. John Wiley and Sons: New York. $9.50.

An authoritative, up-to-date text on soil microbiology is indeed welcome. In the opinion of your reviewer, this phase of soil science does not receive the attention that it should. More nearly adequate understanding of many processes of soil genesis and behavior seems to be limited by our knowledge of the role of soil organisms. Yet so many kinds of organisms exist together in real soils that quantitative research results, contrasting one kind of soil with another, are exceedingly difficult to come by.

The focus in this book is on the organisms themselves—their classification and morphology, and the biological-chemical processes they stimulate—rather than on soils. The biological-chemical processes are well handled in modern terms.

Individual chapters are devoted to bacteria, actinomycetes, fungi, algae, protozoa, viruses, microbial physiology, organic-matter decomposition, cellulose, hemicellulose, lignin, other polysaccharides, hydrocarbons and pesticides, mineralization, and immobilization of nitrogen, nitrification, and denitrification. Two chapters are on nitrogen fixation, four on mineral transformations, and two on ecological relationships.

Despite a short and cryptic introductory chapter on general soil science, very little of the discussion is related to kinds of soil. Most suggestions for application would seem, by implication, to apply to humid, temperate climates. For example, the comparisons among soils under grass, under forest, and under crops would be different on the Latosols. The papers of P. H. Nye and others on the organic matter of these soils would have been helpful. In listing the important small animals in soils, termites are not even mentioned!

The so-called nitrogen cycle needs fuller treatment. The classical diagram in textbooks fails to account for much of the nitrogen taken in by both native and crop plants. Although the author gives emphasis to the role of algae for nitrogen fixation in soils under lowland rice, nothing is said about their role in deserts. Nitrogen fixation by *Beijerinckia* in tropical soils and on the leaves of tropical plants is only mentioned.

These comments are not intended to be critical of the author but to illustrate how far we have to go. We need more study of the microbial population of our soils. Especially do we need the integration of these results with those of soil genesis, soil classification, and the other aspects of soil science to broaden our understanding, and to improve the principles of general soil science that guide our predictions of how soils respond to management.

In the meantime, a lot can be learned from this book that will help our thinking about the soils we know most about.

—CHARLES E. KELLOGG

CHEMICAL AND NATURAL CONTROL OF PESTS. By Dr. E. R. de Ong. 244 pp. Illus. 1960. Reinhold Publishing Company, Inc.: New York. $7.50.

In a relatively few pages for such a large subject, the author has written a well-balanced text. It should prove useful to professional crop specialists, instructors, manufacturers, farmers, and gardeners in evaluating control measures.

Insect and disease control methods are given for major field crops, trees, small fruits, vegetables, and ornamentals, as well as for livestock, household, and storage pests. Some information also is given on weed control.

The first few chapters deal with natural control of pests, their diseases, and the development of plant varieties resistant to insect and disease attacks. The author discusses the subject of using chemical controls to the point where beneficial insects are almost exterminated. He also discusses the development of insects that are resistant to the effects of chemicals.

—B. D. BLAKELY